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**Supplementary material**

# Using macrofaunal communities to inform estuarine classification

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*Environmental variables*

Sediments were dominated by the size fractions silt, sand and medium sand, and to a lesser degree, fine sand by percentage volume (Fig. S1). Coarse and very coarse sand constituted only a small component of the sediments sampled and are not considered any further. Generally, the upper locations of estuaries contained muddier sediments and the lower locations were composed mostly of sand. This was evident in the univariate analysis for the silt and sand components where there was a difference among the locations, which was dependent on estuary type (silt: $F_{\text{Type×Location}} = 4.65$, d.f. = 2, 20, $P = 0.022$; sand: $F_{\text{Type×Location}} = 3.68$, d.f. = 2, 20, $P = 0.040$). In tidal estuaries, the upper locations had much greater percentage volumes of silt than did the mid and lower locations, which were not significantly different between one another (Fig. S1a). In barrier estuaries, the upper locations had four times the percentage volume of silt than did lower locations (Fig. S1a) but no difference was found between mid and upper or mid and lower sampling locations. In comparison to barrier estuaries, tidal estuaries had greater than twice the percentage volume of silt among the upper locations (Fig. S1a).

Percentage volumes of sand in tidal estuaries were three times greater in lower than upper locations. Mid-locations also had greater percentage volumes of sand than did the upper locations (Fig. S1b). In barrier estuaries, the average percentage volume of sand was not different among locations. A difference between estuarine types occurred at the lower and the mid-locations, with tidal estuaries having twice the percentage volume of sand of that of barrier estuaries (Fig. S1b).

Fine sand contributed less than 20% of the sediments, a pattern that was consistent across all estuaries; however, there was a significant location effect among estuaries ($F_{\text{Location}} = 7.59$, d.f. = 2, 20, $P = 0.002$). Upper and mid locations had 2–3 times higher percentage volume of fine sand than lower locations respectively (Fig. 1c).

 

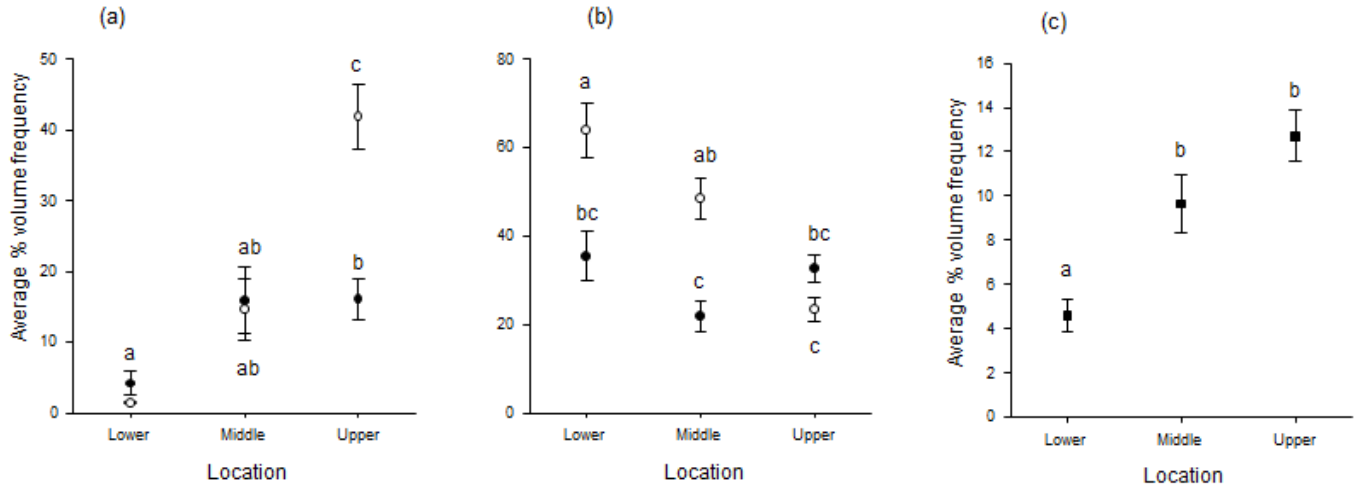


**Fig. S1.** The mean (±s.e.m.) sediment particle sizes measured as the average percentage volume frequency for (*a*) silt and (*b*) sand in barrier estuaries (closed circles), tidal estuaries (open circles), and both estuary types combined (closed squares) for (*c*) fine sand. Means with the same letters are not significantly different from one another.

Differences in average values of TN concentration, %C and pore water salinity in the sediments were evident between the estuarine types, but the pattern depended on the location (TN: $F_{Type\times Location}$ = 3.84, d.f. = 2, 20, $P$ = 0.033; % C: $F_{Type\times Location}$ = 3.79, d.f. = 2, 20, $P$ = 0.036; Pore water salinity: $F_{Type\times Location}$ = 3.88, d.f. = 2, 20, $P$ = 0.040). Values of TN and % C were strongly positively correlated (r = 0.97, $n$ = 108, $P$ < 0.001). Mean values of TN and %C in barrier estuaries were similar at the three locations; in contrast, the upper location of tidal estuaries had up to three times more TN and %C than in all other locations of both estuarine types (Fig. S2a, b). The decrease in pore water salinities in locations furthest from the mouth of the estuary was greatest in tidal estuaries (Fig. S2c). In contrast, the pore water salinity at the lower and mid locations of barrier estuaries were similar, but it decreased at the upper locations (Fig. S2c). Salinities differed between estuarine types at the mid and upper locations only. On average, the mid-location of barrier estuaries was 1.5 times more saline and the upper twice as saline as at the corresponding locations in tidal estuaries (Fig. S2c). Significant differences in TP concentrations and the biomass of MPB were observed among the locations (TP: $F_{Location}$ = 5.09, d.f. = 2, 20, $P$ = 0.017; MPB: $F_{Location}$ = 9.27, d.f. = 2, 20, $P$ = 0.002). TP concentration was approximately four times greater in the upper compared to the lower location sediments (Fig. S2d). The average biomass of MPB in the mid and upper locations was double the average biomass sampled in lower locations (Fig. S2e). Barrier estuaries typically had greater dissolved oxygen concentrations ($F_{Type}$ = 7.24, d.f. 1, 10, $P$ = 0.015; Fig. S2f).

 

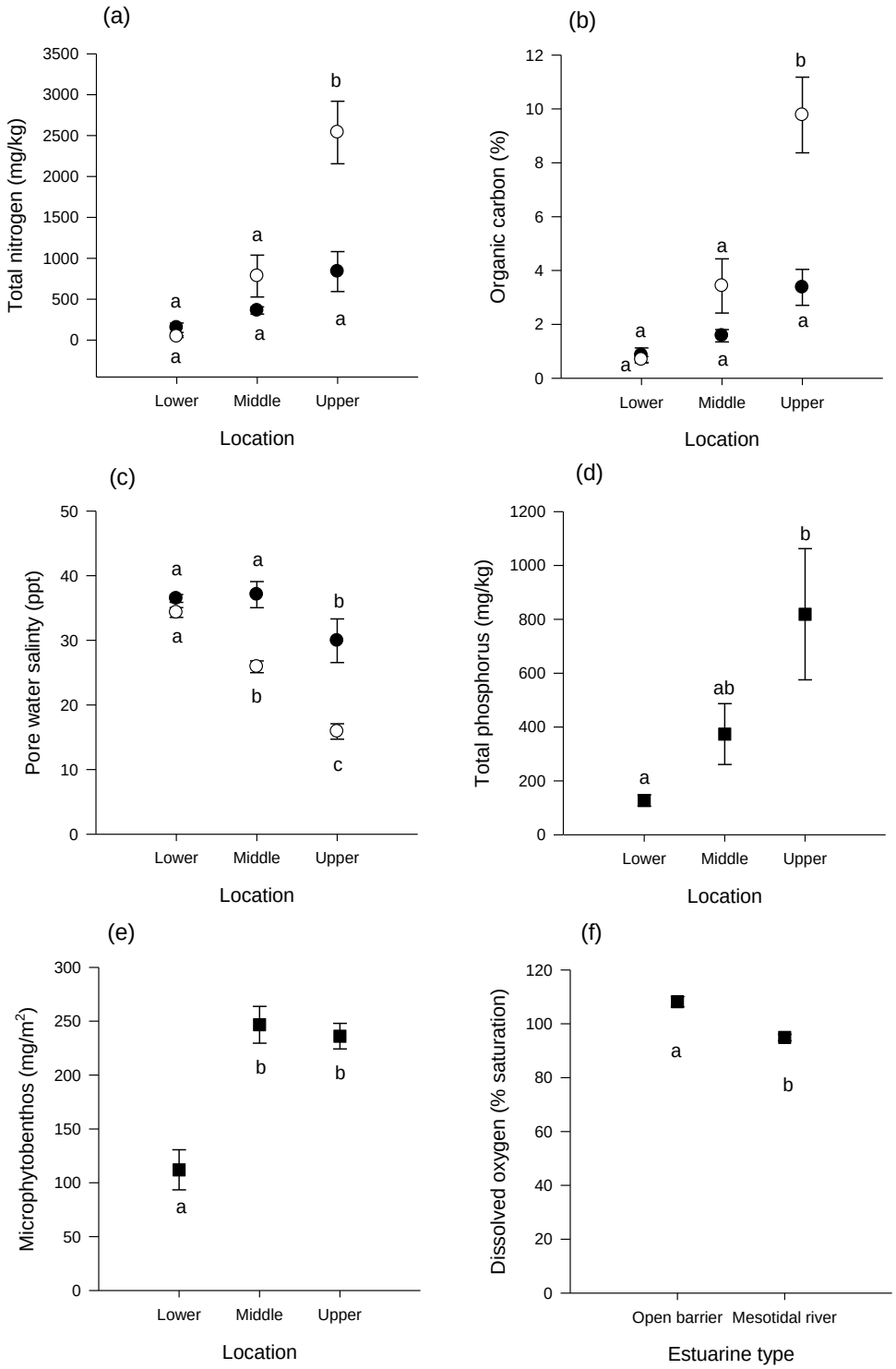


**Fig. S2.** Mean (±s.e.) for (*a)* total nitrogen, (*b*) percentage organic carbon, (*c*) pore water salinity in barrier estuaries (closed circles) and tidal estuaries (open circles), and for (*d*) total phosphorus and (*e*) sediment chlorophyll *a*; in both estuary types (closed squares) at lower, mid and upper estuary locations, and for (*f*) dissolved oxygen in the two estuary types. Means with the same letters are not significantly different from one another.

Seagrass was present at all locations of barrier estuaries (Fig. S3), but was nearly absent in tidal estuaries and restricted to the mid- and lower locations (Fig. S3).

 

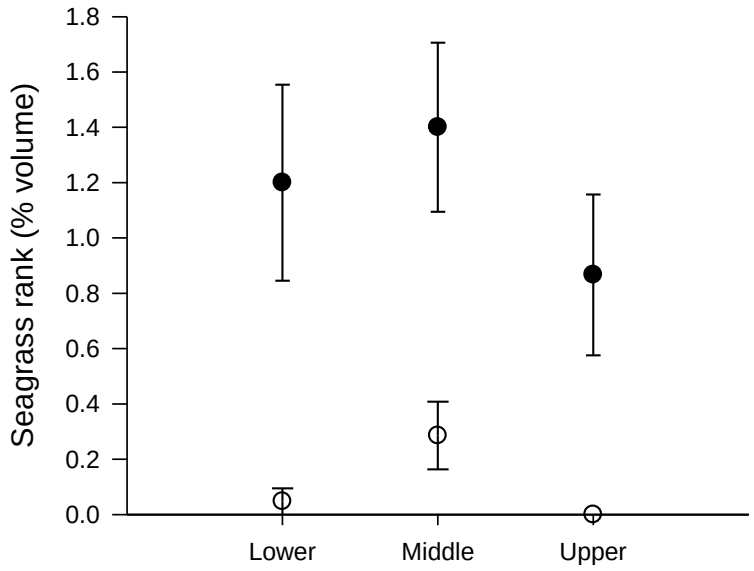


**Fig. S3.** Average (±s.e.) for seagrass rank volumes at each location within each estuary type; barrier estuaries (closed circles), tidal estuaries (open circles).